CLAIMS

1. An organic thin film transistor comprising:

a substrate; and

a semiconductor layer made of an organic semiconductor and formed on the substrate,

wherein the semiconductor layer is composed of crystals of the organic semiconductor, and

a crystal phase of the crystals is the same as a crystal phase of energetically most stable bulk crystals of the organic semiconductor.

2. The organic thin film transistor according to claim 1, wherein a peak position of a diffraction line that indicates a maximum peak intensity value in X-ray diffraction patterns of the crystals constituting the semiconductor layer coincides with a peak position of any one of diffraction lines in X-ray diffraction patterns of the energetically most stable bulk crystals of the organic semiconductor.

3. The organic thin film transistor according to claim 2, wherein a total intensity value of diffraction lines derived from a crystal phase having the maximum peak intensity value is 90 to 100% of a total intensity value of all diffraction lines in the X-ray diffraction patterns of the crystals constituting the semiconductor layer.

4. The organic thin film transistor according to claim 1, wherein the organic semiconductor includes at least one material selected from an acene-based material, a phthalocyanine-based material, and a thiophene-based material.

5. The organic thin film transistor according to claim 2, wherein the

organic semiconductor is pentacene, and

the peak of the diffraction line that indicates the maximum peak intensity value in the X-ray diffraction patterns of the crystals constituting the semiconductor layer is positioned at d = 1.43 nm, where d represents a distance between the Bragg planes of the crystals.

6. The organic thin film transistor according to claim 2, wherein the organic semiconductor is copper phthalocyanine, and

the peak of the diffraction line that indicates the maximum peak intensity value in the X-ray diffraction patterns of the crystals constituting the semiconductor layer is positioned at d = 1.25 nm, where d represents a distance between the Bragg planes of the crystals.

7. The organic thin film transistor according to claim 2, wherein the organic semiconductor is sexithiophene, and

the peak of the diffraction line that indicates the maximum peak intensity value in the X-ray diffraction patterns of the crystals constituting the semiconductor layer is positioned at d = 2.24 nm, where d represents a distance between the Bragg planes of the crystals.

8. The organic thin film transistor according to claim 1, wherein the substrate is a plastic plate.

9. The organic thin film transistor according to claim 8, wherein the plastic plate is made of any one of materials selected from polyimide, aromatic polyester, polyacetal, polyurea, and polyphenyl sulfone.

10. The organic thin film transistor according to claim 1, wherein the substrate is a plastic film.

11. The organic thin film transistor according to claim 10, wherein the plastic film is made of any one of materials selected from polyimide, aromatic polyester, polyacetal, polyurea, and polyphenyl sulfone.

12. The organic thin film transistor according to claim 1, further comprising electrodes for transferring charge to the semiconductor layer,

wherein the electrodes are made of at least one selected from a metal and a conductive polymer.

13. The organic thin film transistor according to claim 12, wherein the electrodes include at least one material selected from gold, copper, nickel, aluminum, titanium, molybdenum, polypyrrole, polythiophene, polyaniline, and polyphenylene vinylene.

14. A method for manufacturing an organic thin film transistor comprising:

forming a semiconductor layer by depositing an organic semiconductor on a substrate,

wherein the organic semiconductor is deposited at a deposition rate of 0.1 to 1 nm/min while maintaining a temperature of the substrate in a range of 40 to 150°C.

15. The method according to claim 14, further comprising:

cooling the semiconductor layer slowly after the semiconductor layer is formed by depositing the organic semiconductor.

16. The method according to claim 15, wherein the semiconductor layer is cooled slowly by decreasing an ambient temperature around the semiconductor layer at a rate of 1°C/min or less.